CLAIMS

1. A backpack for back-mounting a compressed-air cylinder (50), fastened to the backpack by a cylinder fastening belt (40), when a user wears harnesses (30) and a waist belt (20), comprising:

a backboard (100) which holds, on an upper portion thereof, one ends of the harnesses (30) and holds, at both sides of a middle portion thereof, the cylinder fastening belt (40), and comprises a pair of support hooks (105) that protrude from a lower portion of the backboard (100) while being spaced apart from each other to support thereon the compressed-air cylinder (50);

a harness support (130) which holds, at opposite arms thereof, the other ends of the harnesses (30) and is coupled to a lower portion of a back surface of the backboard (100) so as to rotate upwards and downwards around a center thereof, with the opposite arms of the harness support (130) longitudinally extending horizontally in opposite directions;

a waist protector (120) having a plate shape coupled to the backboard (100) at a position in the back of the harness support (130) so that both ends of the waist protector rotate upwards and downwards around a center of the waist protector, with ends of the waist belt (20) coupled to the ends of the waist protector, the waist

protector thus covering and protecting the back of the user's waist; and

a rotary unit for rotatably supporting both the harness support (130) and the waist protector (120) on the backboard (100).

2. The backpack according to claim 1, wherein the harness support (130) comprises:

a longitudinal rectangular plate (132) extending in a horizontal direction and coupled to the backboard (100) so as to rotate upwards and downwards around a center thereof; and

a harness coupling bracket (134) coupled to each end of the longitudinal rectangular plate (132) so as to bend, with a harness coupling hole (134a) provided on an end of the harness coupling bracket to hold the other end of each of the harnesses (30).

3. The backpack according to claim 2, wherein the harness coupling hole (134a) of the harness coupling bracket (134) is formed as a longitudinal hole extending in a horizontal direction,

wherein the harness coupling hole (134a) is inclined downwards in a direction from an inside to an outside part of the harness coupling bracket (134) at an inclination angle (β) of 22° ~ 55° relative to a horizontal axis so that

the other end of each of the harnesses (30) is coupled in an inclined position to the harness coupling bracket (134).

4. The backpack according to claim 1, wherein the rotary unit comprises:

a hinge shaft (250) protruding from the center of the waist protector (120) and sequentially passing through the center of the harness support (130) and a center of the lower portion of the backboard (100), thus serving as a rotating shaft for both the waist protector (120) and the harness support (130);

a hinge shaft cover (255) mounted to the hinge shaft (250) at a position in front of the backboard (100), so as to rotatably couple the hinge shaft (250) to the backboard (100); and

a locking member (290) which locks the hinge shaft cover (255) to the hinge shaft (250).

5. The backpack according to claim 4, wherein the rotary unit further comprises:

rotation guide means for guiding rotation of both the waist protector (120) and the harness support (130), and controlling rotating angles of the waist protector and the harness support, the rotation guide means comprising:

guide protrusions (260) protruding from opposite sides of the waist protector (120); and first and second

longitudinal guide holes (260a and 260b) having an arc-shaped appearance and receiving the guide protrusions (260) therein, and formed on opposite sides of the lower portion of the backboard (100) and opposite sides of the harness support (130), respectively, wherein, after the guide protrusions (260) sequentially pass through the first and second guide holes (260a and 260b), protrusion covers (265) are mounted to the guide protrusions (260) using a plurality of locking screws (290a) so that the guide protrusions (260) move upwards and downwards along the first and second guide holes (260a and 260b), thus controlling rotating angles of both the waist protector (120) and the harness support (130).

6. The backpack according to claim 5, wherein the first guide holes (260a) formed on the backboard (100) and the second guide holes (260b) formed on the harness support (130) are shaped to have arc angles (θ) set to 22° ~ 28° and (α) set to 7° ~ 13°, respectively, around the center of the hinge shaft (250) passing through the backboard (100) so that the arc angles (θ and α) determine lengths of the first and second guide holes (260a and 260b).

7. The backpack according to claim 4, wherein the rotary unit further comprises:

rotation guide means for guiding rotation of the

harness support (130), the rotation guide means comprising:

longitudinal guide holes (562) formed on both sides of each of the longitudinal rectangular plate (132) of the harness support (130) and the backboard (100); and flanged rod-shaped protrusions (565, 565') passing through the longitudinal guide holes (562), with a plate-shaped or ring-shaped locking member (568, 568') mounted to an end of each of the flanged rod-shaped protrusions (565, 565'), so that the flanged rod-shaped protrusions (565, 565') move in the longitudinal guide holes (562) during rotation of the harness support (130).

8. The backpack according to claim 4 or 7, wherein the rotary unit further comprises:

rotating angle control means for controlling the rotating angle of the waist protector (120), the rotating control means comprising:

the hinge shaft cover (255) having a rectangular shape and mounted to the end of the hinge shaft (250); and inclined protrusions (610) formed on the backboard (100) on opposite sides of the hinge shaft cover (255) to stop the hinge shaft cover (255) during rotation of the hinge shaft cover (255), thus causing the waist protector (120) to rotate within an angular range determined by an inclination angle (γ) of the protrusions (610).

9. The backpack according to claim 1, further comprising:

a lift assembly to move the waist protector (120) vertically on the backboard (100) while sliding the protector on the backboard (100).

10. The backpack according to claim 9, wherein the lift assembly comprises:

a guide boss (710) protruding from the waist protector (120) to face the rotary unit, thus moving vertically along with the waist protector (120) during vertical movement of the waist protector, with a vertical slot (712) formed on a front surface of the guide boss;

a lift guide (720) closely placed on a rear surface of the guide boss (710);

a guide protrusion (722) extending from the lift guide (720) to pass through the vertical slot (712) of the guide boss (710), and coupled to the rotary unit at an end thereof, thus guiding vertical movement of the guide boss (710); and

a locking member for mounting the guide protrusion (722) of the lift guide (720) to the rotary unit.

11. The backpack according to claim 10, wherein the guide boss (710) has a rounded shape (R) on the front surface thereof, thus causing the guide boss (710) to move

vertically while forming a curved trace caused by the rounded shape (R).

12. The backpack according to claim 10, wherein the lift assembly further comprises:

tilting means for tilting the waist protector (120) during forward and backward movement of the waist protector (120).

13. The backpack according to claim 12, wherein the tilting means comprises:

the lift guide (720) having slope surfaces to define a triangular cross-section; and

a guide ring member (740) having a triangular cross-section corresponding to the lift guide (720) and fitted over the guide protrusion (722) of the lift guide (720) to be closely placed on the front surface of the guide boss (710), so that both the lift guide (720) and the guide ring member (740) execute a seesawing motion while supporting the guide boss (710) by protruding parts thereof having the slope surfaces.

14. The backpack according to claim 10, further comprising:

an anti-friction member (760) having a ring shape and fitted over the guide protrusion (722) of the lift guide

(720) at a position between the guide boss (710) and the lift guide (720), thus preventing direct contact of the guide boss (710) with the lift guide (720).

15. The backpack according to claim 14, wherein the anti-friction member (760) is shaped to have a zigzag cross-section, thus elastically supporting the lift guide (720) relative to the guide boss (710).

16. The backpack according to claim 1, further comprising:

flashing lamps (104) provided on opposite sides of the lower portion of the backboard (100) to make flicker; and

a protective plate (140) which extends downwards from a lower end of the backboard (100) while maintaining a predetermined width and bending at a lower part thereof to protrude forwards from the backboard (100), so as to protect an end of the compressed-air cylinder (50) fastened to the backboard (100) from external impact.

17. The backpack according to claim 16, wherein the protective plate (140) further comprises:

a pair of reinforcing ribs (142) extending along opposite side edges of the forward bending part of the protective plate (140) to increase strength of the

protective plate (140) in a vertical direction; and

a battery casing (106) provided between the pair of reinforcing ribs (142) to be protected at opposite sides thereof by the reinforcing ribs (142) and holding a battery therein to supply electricity to the flashing lamps (104) of the backboard (100).